

The Mining Journal

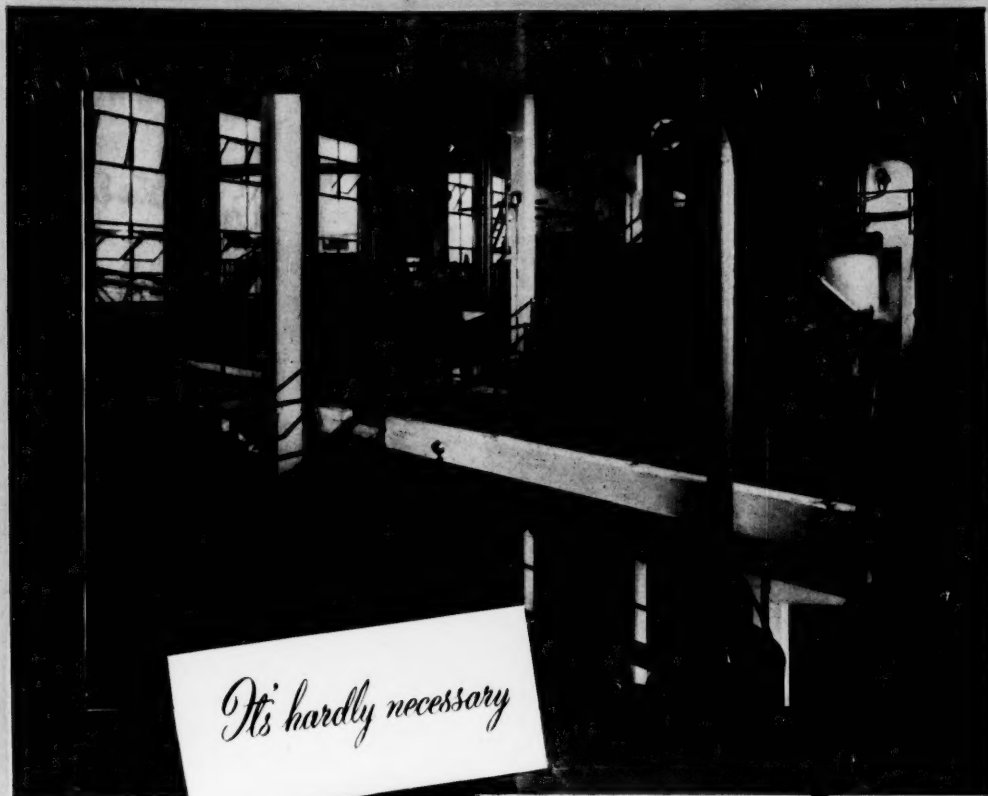
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Railway & Commercial Gazette

Vol. CCXXXIX No. 6107

LONDON, SEPTEMBER 5, 1952

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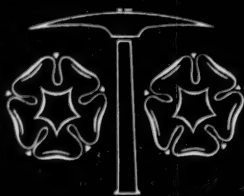
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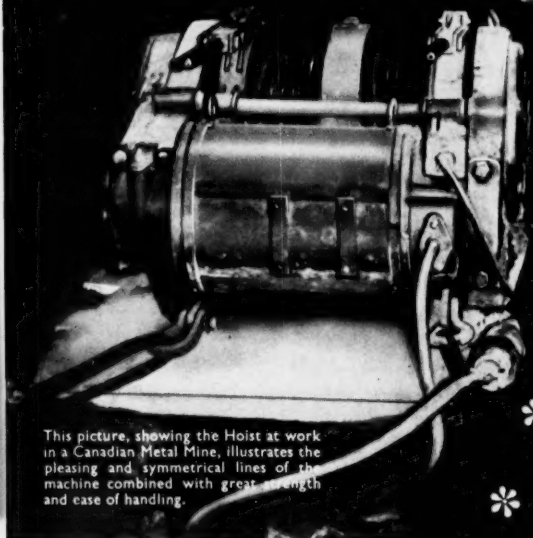


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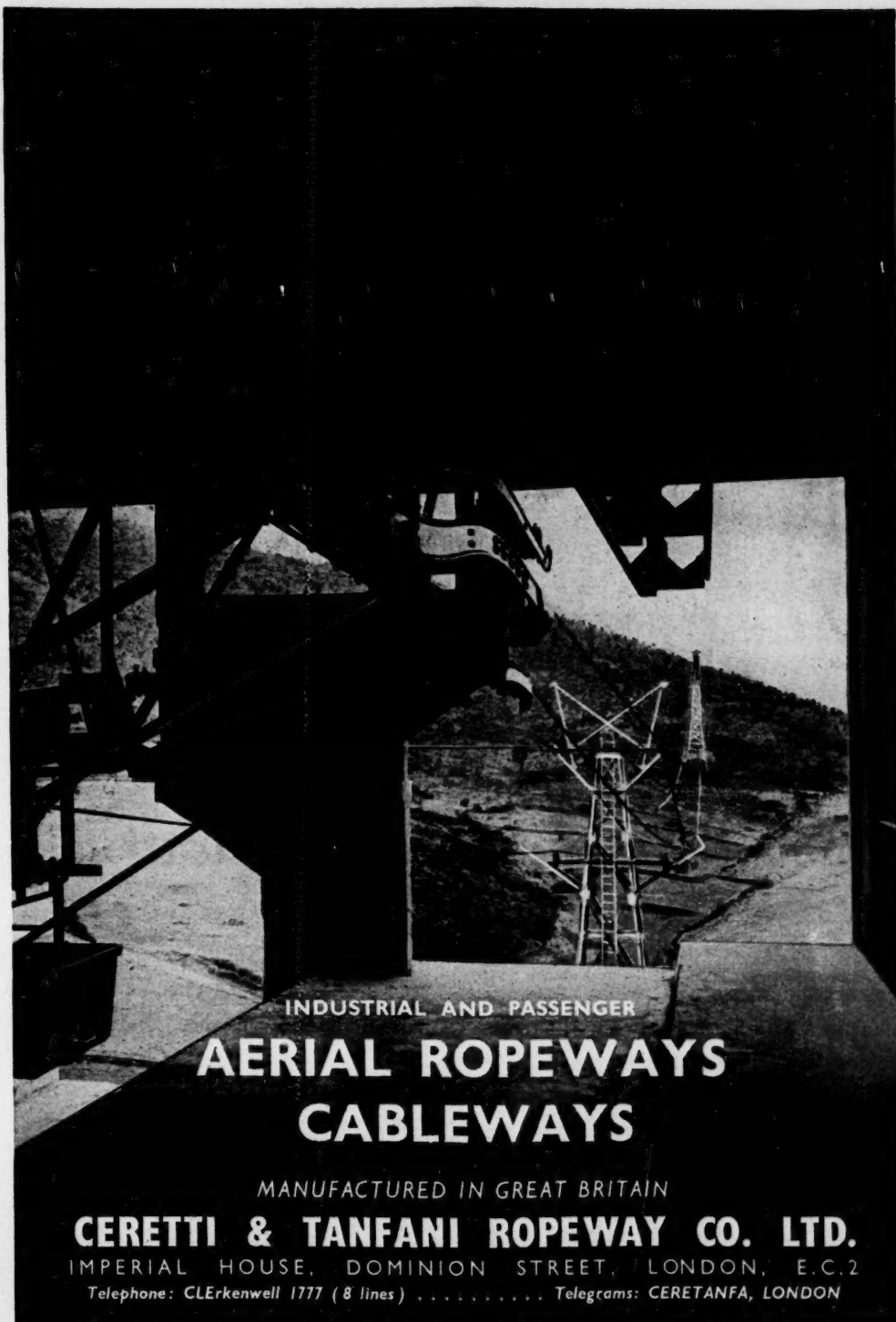
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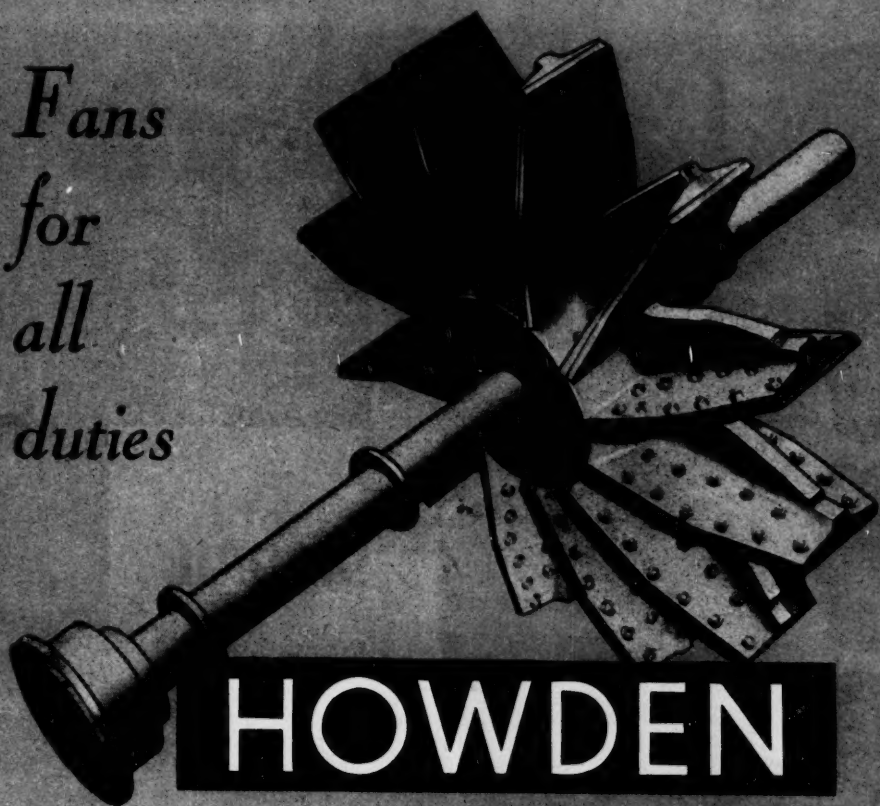
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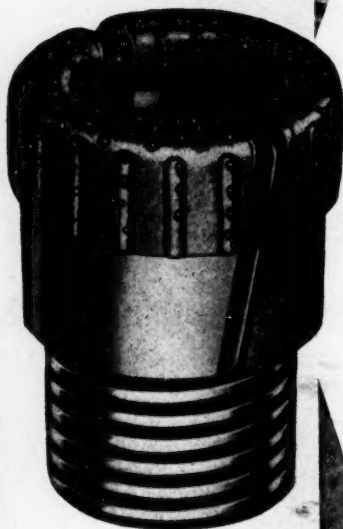
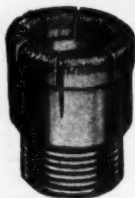


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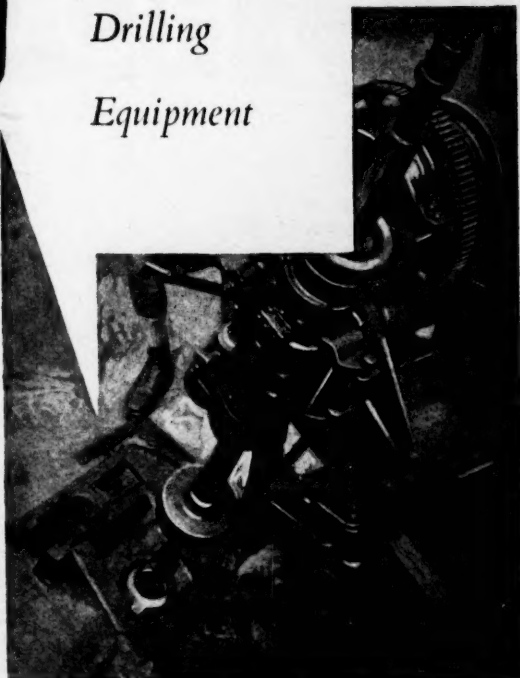
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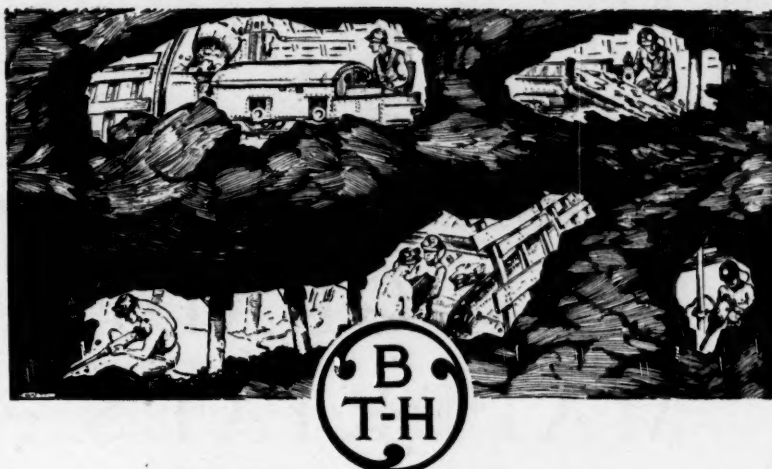
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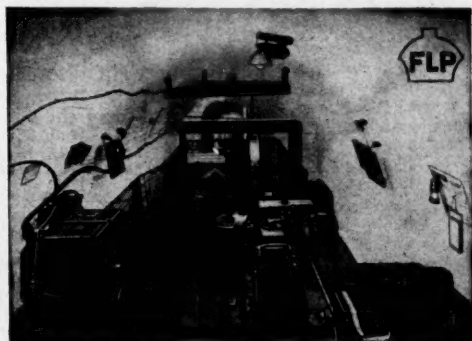


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The Mining Journal

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NOTES AND COMMENTS

The Problem of U.S. Materials Self Sufficiency

Few people outside official circles in the United States probably realize as yet the immensity and variety of the efforts which the Administration in Washington is making to investigate latent possibilities of the production of mineral products essential to the progress of the world in the years to come.

Through the medium of the Paley Report we are giving some account of the great network of development both within the United States and abroad. In the main, this Report recognizes that in many materials the United States is passing, or has already passed the condition of self-sufficiency and is becoming a "have-not" territory. In the British Commonwealth the emphasis of this movement is chiefly viewed as the diversion overseas of United States financial and technical power in the development of new sources of industrial materials. At the same time, however, great efforts are being focused on the development of internal U.S. resources under the aegis of the Department of the Interior—U.S. Bureau of Mines, the Geological Survey, and the Defence Materials Exploration Administration—as well as through the Department of Agriculture. These activities are concerned, not only with intensive efforts to bring into the scope of economic exploitation deposits of conventional mineral occurrences but also of complex minerals which may yield a number of essential metals and minerals through the application of techniques hitherto untried commercially, and also of successful retreatment of residues and alloys from which at present there is little or no economic recovery.

Speaking very broadly, the work of the Department of the Interior is directed to materials potentially available within the United States and is motivated largely by the consideration that under modern war conditions supplies of essential materials might be temporarily, at any rate, denied to the United States from overseas countries. This consideration seems to involve the possibility of eventual conflict with many of the recommendations made in the Paley Report which, broadly speaking, advocates increasing reliance on overseas sources of supply and the means by which these can be enlarged and their output stimulated, in contrast with the policy of seeking to make the United

States completely self-supporting if cut off from the rest of the world. We have already noted the satisfaction expressed at the semi-independent position already achieved in regard to tin and the possibilities which would result from an intensification of that policy on the economies of Far Eastern countries where a prosperous tin industry means so much in the way of success against Communist encroachment.

The abstracts, summarized in a Reuter despatch, printed elsewhere, from the Semi-Annual Report to Congress on the stockpiling programme, indicates that there are other minerals and metals which may be also affected by the enormous range of technical studies now being carried on backed by the full power of American defence allocations now currently available. It is far too early to suggest that these two lines of projected enterprise may come into serious conflict in the course of time, or if they do, that they cannot be adjusted. For the moment we can only suggest that in the interests of United Nations harmony American ability to become entirely self-supporting should be retained as a hidden resource to be used only in case of need, and not promoted to an extent which would prejudicially affect exploitation of normal mineral supply within the orbit of the United Nations co-operation.

Bolivian Mining Background

The latest issue of the U.S. Bureau of Mines publication, *Mineral Trade Notes* for May, just received, throws additional light on the background of the Bolivian mining industry previous to the last revolution. As has been surmised in *The Mining Journal*, some 10,000 tons of tin exported from Bolivia remained unsold at Pacific Coast ports, so that out of a total export of 33,133 tons of tin only some 23,000 went overseas. The Patiño interests maintained their flow of concentrates to Great Britain but the Hochschild and Aramayo companies, the Banco Minero, and the Medium Producers were without a market. Other adverse factors were a rise of 30 to 40 per cent in labour costs, an increase of 20 per cent in railway freights and of 20 to 40 per cent in the cost of imported equipment.

At the Hochschild experimental station in Oruro further study of both flotation and volatilization are said to have

proved promising. The sink-and-float plant at Cataoi is described as successful, and extensive flotation experiments were carried on there in the hope of evolving a method of treatment of dumps said to contain 50,000 tons of metal. The Patiño interests also had the Batelle Memorial Institute carry out further researches on flotation. Tin volatilization research with chlorine was continued in England. Negotiations to exchange low grade concentrates for German machinery were under negotiation with the Metallgesellschaft.

In contrast to tin the U.S. smiled on Bolivian tungsten mining. Last year's exports of concentrates totalled 1,631 tonnes, of which 1,447 was shipped to the U.S. The Banco Minero estimates that a further 300 tons of concentrates were held at the mines. The G.S.A. signed long term contracts with the Banco Minero for 3,000/5,000 tons of concentrates deliverable over five years and a similar one with the Hochschild company for the Bolsa Negra mine output while the Export-Import bank, as already noticed in *The Mining Journal*, gave a loan of \$1,000,000 to develop the property and the Bolivian Tin and Tungsten Corporation received a similar loan. Aramayo obtained a loan of \$580,000 to develop tungsten deposits at Pacuni and the Banco Minero solicited one of \$2,000,000 to build a central tungsten processing plant.

Expanding Mining Activities in Israel

According to a forecast by the Israel Ministry of Agriculture and Development, mining activities in the Negev, the southernmost part of the country, are to be expanded within the next three years to such an extent as to make possible the winning of minerals worth some £1.10,700,000. Part of the capital funds required for this project are to be derived from the exploitation of phosphate deposits next year while the revenue from the production of kaolin is expected to reach £1,500,000 annually by 1954. The exploitation of the copper deposits found near Elath, 18 miles north of the Gulf of Aqaba, is to be started in the very near future, the output to aggregate some 5,000 tons p.a. valued at approximately £1,200,000. Other minerals to be exploited include from 20,000 to 30,000 tons of manganese per annum and more than £1,000,000 worth of other minerals within two years from the resumed operations of the large Dead Sea Potash Works.

Mention was made in the Notes and Comments of our issue of March 7, 1952, of the results of the work done by Israel Mining Industries in the Negev. The I.M.I., a Government-owned company, has reached the mining stage in the cases of phosphate rock, ceramic clays and glass sands. Geological surveys are being completed for mica, feldspar and quartz, a further survey for sulphur has commenced, and at the time of our note exploration for copper, manganese and iron ore was being continued.

Nor is Israel's activity in minerals exploitation confined solely to her dry land territories. Government interest is aiding the prospective exploitation of other natural deposits of the State, as scientific investigations lately concluded suggest the presence of minerals and other natural resources in underseas areas adjoining the coastline. The Government has announced that the area of the State of Israel is to include the sea bed and subterranean areas adjoining the coasts of the country up to and beyond the territorial waters limit. These areas will embrace any point where depth of water permits the exploitation of the natural resources of the areas, but nothing in this statement affects the territorial waters of Israel or the waters of the high seas.

The Government points out that this national claim is similar to those made by other countries.

Southern Rhodesia

(From Our Own Correspondent)

Salisbury, August 25

Caution is the keynote of reaction in Southern Rhodesia to the news that Mr. N. C. Havenga, South Africa's Finance Minister, has secured the British Government's support for his claim to a higher world price for gold. While it is admitted that a higher price would relieve Southern Rhodesian gold producers of their present anxieties, it is feared that such relief would be short-lived. The memory of what has happened since the devaluation of sterling is too green.

Experience during the past three years has brought home to Rhodesian producers the fact that, because gold occupies a unique position as a monetary standard, adjustments of the market price do little to secure a permanent widening of the margin between working costs and revenue. While affording temporary relief, an increased price inevitably leads to further inflation of working costs.

As proof of this, when sterling was devalued in September, 1949, the official index of the cost of mining stores (August 1939=100) stood at 149—large mines 146, medium mines 152 and small mines 153. The latest index number is 188—large mines 182, medium mines 194 and small mines 193. Devaluation increased the sterling price of gold by approximately 44 per cent, but already the cost of production has increased by about 26 per cent. Furthermore, the Government subsidy of 27s. 6d. per f.o.z. produced was withdrawn immediately after devaluation, so the mines are in effect worse off to-day than they ever were. It is feared that any further increase in the price of gold would only lead to further inflation and it is now more generally appreciated that the only final answer to the gold producers' problem is a lowering of working costs rather than an increase in revenue.

This year's budget proposals gave the gold miners relief in two directions. The whole of the output (instead of 40 per cent) could be sold on the premium market and a 10 per cent depletion allowance reduced their taxable income. But the premium works out at barely £1 per f.o.z. and the depletion allowance falls short of the 25 per cent requested. The only ray of hope is that the Government has agreed to the Mining Affairs Board carrying out an examination of the position of borderline mines before the end of this year and miners are being asked to make their accounts available for this purpose. If the case is sufficiently strong, it is presumed that some form of subsidy will be recommended.

Meanwhile, the value of mineral output in Southern Rhodesia in the first half of 1952 has reached the record figure of £10,814,146—a record even when allowance is made for the abnormal declaration of chrome ore output in June. This year's budget raised the royalty on base mineral outputs to a flat rate of four per cent on value. Previously the levy on chrome ore had been 5d. per ton on outputs exceeding 100 tons per month. The effect of the new rate in this particular case was to raise the royalty to about 4s. per ton.

Owing to railway congestion, a stockpile of more than 500,000 tons of chrome ore had accumulated in recent years and no royalty had been paid on this production. The companies have now elected to declare this tonnage at the old rate, while—as a *quid pro quo*—the Government has insisted that future outputs shall be declared in full and royalty paid at the new rate, irrespective of whether railway transport difficulties compel the companies to put a portion of their current output into stock

Progress in Nigeria

By A. G. THOMSON

Africans have mined iron, lead and tin in Nigeria for centuries. The occurrence of tin in Northern Nigeria was first indicated to Europeans by the presence of quantities of small faggots of very pure metal in the native markets, which occasionally found its way down to the coast. Until the beginning of this century, however, when the territory was transferred from the Royal Chartered Niger Co. to the Colonial Government, the country away from the valley of the Niger and Benue was practically unknown. As soon as the Government had satisfied themselves as to the safety of travelling in the territories the Niger Co. despatched an expedition to carry out a geological examination of the country east of the Niger. The tin was eventually traced to the Province of Bauchi.

Our early knowledge of the geology and mineral resources of Nigeria is based on mineral surveys directed by the Imperial Institute in 1903-1913. The Mineral Survey in Southern Nigeria was started by Dr. John Parkinson in 1903, and the following year Dr. J. D. Falconer initiated the Mineral Survey of Northern Nigeria. After the 1914-18 war, the Geological Survey of Nigeria was established with Dr. Falconer as its first Director. There are at present 24 geologists on its staff. The Survey has its headquarters at Kaduna and branch offices at Jos and Enugu.

Mining rights in Nigeria are vested in the Government, but under an agreement with the Royal Niger Co.—when the charter was revoked—this company received half the gross profits derived from royalties in minerals won between the main stream of the Niger on the west and a line running directly from Yola to Zedee in the east. This agreement runs for 99 years with effect from Jan. 1, 1900. Three years ago, the United Africa Co., a subsidiary of Unilever Ltd., who had bought up the Royal Niger Co., sold their rights to the Nigerian Government.

CASSITERITE AND COLUMBITE

Nigeria's principal mineral products are cassiterite and columbite—both mined in the Plateau Province—and coal mined at Enugu. The territory's tin industry came into prominence fifty years ago, when the richness of the Bauchi deposits led to the speedy development of mines. At the time of the first world war the Ropp Tin Co., which operated near Jos, was the fifth largest tin-producing company in the world. During 1939, exports of tin ore amounted to 14,554 tons and in 1944 they exceed 17,000 tons. Last year 11,753 tons valued at £8,974,372 were shipped. The entire output is exported to the United Kingdom and represents about a quarter of Britain's total supplies.

The reserves of cassiterite amount to approximately 100,000 tons of proved and 33,000 tons of indicated mineral. On the basis of the current annual output, this would give a life of nine years for the known Nigerian deposits. The first authentic discovery of lode tin in the territory was recently made by North Maroc Ltd. on the western scarp of the Bauchi Plateau. It is reported to be nearly vertical and has been opened to an average depth of 35 ft. for a distance of 800 ft. along the strike.

Deep leads are known to exist in Nigeria but surveys are stated to have shown that the magnetic method is of little use in locating buried leads and resistivity methods are of doubtful value as a guide to sub-basalt leads, though possibly applicable to leads beneath fluvio volcanic formations.

Nigeria is the world's largest producer of columbite. Over 6,000 tons were won during a period of 10 years, the peak year being 1944 when 2,072 tons were produced. This included 1,000 tons which the Associated Tin Mines of Nigeria obtained by re-treating the alluvial tin-mining dumps. Last year's exports amounted to 1,092 tons worth £838,713.

Until quite recently it was assumed that the fine crystalline columbite found with tinstone in the Younger Granite alluvials was derived from the same lodes and greisens as the tin and tungsten ores. It has now been established, however, that columbite is widely disseminated in the biotite granites as a primary accessory constituent. Probably it occurs in all the Younger Granites, though it may not always be present in sufficient quantities to give rise to workable alluvial deposits. The heavy mineral residues obtained by panning decomposed granite at Liruti have yielded a little fine crystalline columbite, some yields being as high as $\frac{1}{2}$ lb. per cu. yd., corresponding to 0.02 per cent by weight. The heavy mineral residues also contain appreciable amounts of thorite, a little monazite, and abundant malacon. The occurrence of columbite as a primary accessory of the Younger Granites is being investigated by the Geological Surveys. The bulk of the columbite is produced by the big mines in the Plateau, but substantial amounts are also mined in the Bauchi and Kano Provinces.

PROGRESSIVE EXHAUSTION OF DEPOSITS

The Chief Inspector of Mines recently pointed out that the territory's limited reserves of columbite will become exhausted progressively with the exhaustion of the tin deposits, and suggested that more attention should be paid to the appreciable losses which occur in the ordinary tin dressing methods. Nigerian cassiterite is characterized by great variation in magnetic permeability. Of the cassiterite contained in various concentrates examined in the Geological Survey Laboratory in 1950-51, approximately 15 per cent were of the magnetic variety. A small proportion of the magnetic cassiterite has a permeability comparable with that of ilmenite, but by far the greater amount overlaps with that of columbite. A clean electromagnetic separation of the two metals is thus impossible and milling practice therefore reverts to gravity, pneumatic or electrostatic methods. Experiments in the laboratory have shown that magnetic cassiterite can be rendered completely non-magnetic by heat treatment, after which it might be possible to separate shipping grade columbite, etc., electromagnetically.

About a hundred miles to the east of Omitsha is situated the valuable coalfield of Udi, whose importance to West African industry can hardly be over-estimated. The coal is of good quality and the supply is almost inexhaustible. In 1939, the Enugu Colliery produced for local use 323,266 tons of coal, but by the year ended March 31, 1945, production had risen to the record figure of 668,158 tons. In 1950 it was 580,587 tons.

Formerly the coal mines were worked by the Railway Department for the Government. On December 31, 1950, however, the coal industry came under the Nigerian Coal Corporation, which had been established by the Nigerian Coal Corporation Ordinance No. 29 of 1950. The position regarding mine rolling stock and other equipment is now

satisfactory and a programme of drilling ahead of the workings to ascertain the coal reserves has been restarted. In view of the rapidly growing demand for coal in Nigeria and for exports the opening up of a new colliery is under consideration.



(Courtesy of Central Office of Information)
The paddock at Pengal Camp Mine. The wash containing the tin concentrate lies 15 ft. below the overburden

For the past two years the Geological Survey has devoted considerable attention to the Cretaceous of the Eastern Provinces and the Benue and Gongola Valleys. In particular, seams of good quality coal up to 8 ft. thick have been located and sampled by pitting in Benue Province, up to 60 miles north of the existing Enugu Colliery. Pitting has also disclosed coals in the Gombe Division of Bauchi Province, and although of inferior grade and variable thickness, their position in an area distant from other sources of fuel renders these seams of possible local value. The coals of Afikpo in Ogoja Province have also been examined to determine their coking properties. Last year drilling of the Orukram seam, mapped in the previous year, showed that the seam maintains an average thickness of 7 ft. 6 in. over a considerable area and that about 1,000,000 tons can be won by open-casting. Lignites found in the Benin Provinces were geologically mapped in 1948 and are now being sampled by a series of diamond drill holes.

Lead-zinc ores with small silver contents occur in the lower Cretaceous sediments in the south-eastern part of the country. Silver and lead production has been carried out on a comparatively small scale by the Northern Nigeria Lead Mines, the output of lead concentrate amounting to a few hundred tons per annum. Recent production in Nigeria has been very limited and has been obtained purely as a by-product of exploration to prove deposits. The Amalgamated Tin Mines of Nigeria and the Mines Development Syndicate (West Africa) have been investigating the workings of lead zinc deposits in the Ogoja Province, and the cores of a large number of diamond drill holes have been examined by the Geological Survey. Other promising lead-zinc ore bodies near Wase in Plateau Province have also been investigated.

Last year it was announced that agreement on all important points had been reached between the Nigerian Government, the American Smelting & Refining Co. and the Mines Development Syndicate (West Africa) concerning the terms of a lease under which American Smelting & Refining will undertake to provide all the capital

required to bring into production the lead-zinc areas in Southern Nigeria held by the Syndicate. In the last report of American Smelting & Refining it was stated that results to date indicated the possibility of establishing a substantial lead-zinc mining industry.

There is a small gold mining industry, which is in the hands of small firms or private operators, the majority of both being Nigerians. Production is mainly absorbed internally and has declined since the beginning of the war.

Before the war the Anglo-Iranian and Shell Groups jointly made a careful search for oil in the southern part of the country north of Port Harcourt. In view of the occurrence in this area of a great thickness of gently-folded Cretaceous and Tertiary sediments of marine and shallow water origin, it was reasonable to suspect the presence of oil, though not necessarily in commercial quantities. The investigation was interrupted by the war, but the Shell D'Arcy Co. have now resumed the search and have started drilling. The Geological Survey are maintaining close liaison with the geological staff of the oil exploration parties. Deep drilling in the Chad basin at Maiduguri has been commenced with the intention of reaching a depth of 4,500 ft. in search of artesian water.

There has been some production of tantalite and a few years ago a small quantity of mica was mined in the Kabba Province. Other known mineral deposits include minor occurrences of rutile, beryl, phosphate, fluor spar, etc.

Investigations have shown that cement of excellent quality could be made from extensive deposits of limestone, clay, shale, etc., which occur in the sedimentary formations. At Nkalagu, about 20 miles east of the Enugu Colliery, a number of limestone beds of quality suitable for cement manufacture have been surveyed and sampled. The reserves are adequate and an intensive diamond drilling programme is now in progress. Commercial enterprise is actively interested in this project. Limestones have also been investigated in other provinces, but although some offer adequate reserves of good quality material, they are less favourably situated in relation to supplies of fuel. Sands from the coal mines at Enugu have proved suitable for the production of bottle glass.



(Courtesy of Central Office of Information)
An electric coal cutter at Obvetti Mines, Enugu Colliery

Work on radio-active mineral resources was started in 1949, and has led to the discovery of one of the most extensive deposits of uranium so far found in a British Dependent Territory. Associated with the uranium are large quantities of niobium. Provided that extraction difficulties can be solved, the potential benefits of this occurrence to the sterling area should be very great.

U.S. Development of Domestic Sources of Critical Metals and Minerals

Development in the United States of domestic sources of stockpile materials is summarized in the semi-annual Report to Congress on the Stockpiling Programme, issued in Washington this month. This development is carried out by the Department of the Interior and the Department of Agriculture. Additional mention is made in our "Notes & Comments" and extracts by Reuters from the report covering the period January to June, 1952, are as follows:

The year-old programme of the Defence Minerals Exploration Administration to increase domestic ore reserves of strategic and critical minerals and metals began to bear fruit during January/June, 1952. This programme (under which private exploration and development are encouraged by federal financial assistance) has resulted in certification of eleven discoveries or developments of vitally needed mineral deposits including tungsten, monazite, mica, beryl, manganese and sulphur. Certifications are made when exploration projects result in discovery or development of deposits of ore in sufficient quantities to indicate possible commercial operation.

Aluminium: The importance of investigating methods to increase the availability of aluminium ores has become greatly accentuated as a result of new aluminium requirements for civilian and military consumption and stockpiling. The Government-owned experimental alumina plant at Laramie, Wyoming, will be operated on an experimental basis to test alkaline sinter processes for recovery of alumina and a cement raw material by-product from clays, the rock anorthosite, and other domestic aluminous materials.

The Bureau of Mines is currently conducting desilication tests on bauxites and bauxitic clays of high silica content in order to determine whether the known vast quantities of these materials can be utilized. A co-operative research project, on direct electrothermic reduction of clay androphyllite, has been successfully completed. As a result, the Apex Smelting Co. is constructing a pilot plant with a 2,000 K.V.A. furnace to produce silicon-aluminium master alloys.

Asbestos: The Bureau of Mines arranged for the delivery of a bulk sample of asbestos for use in an experiment to determine if Canadian chrysotile can be beneficiated in a paper-makers' Vortrap sufficiently to permit its use as a substitute for non-ferrous Rhodesian chrysotile. D.M.E.A. projects number seven.

Beryllium: Nine beryl-mica D.M.E.A. exploration projects were still under way at the close of the period. They involve \$120,569.

Cobalt-Nickel: The search for these deposits is being carried on by five D.M.E.A. exploration projects at a total cost of \$546,932.

Columbite-Tantalite: The programme of columbite and tantalite investigations begun by the Geological Survey last year continued with investigations of columbite in Arkansas bauxite and at Magnet Cove, Ark.

Copper: No notable copper discovery was reported in the United States within the period nor have there been developments which significantly alter the basic copper reserve position of the United States. An aggressive search for additional deposits of copper is demonstrated by the fact that 22 D.M.E.A. projects are active at a cost of \$1,636,417.

Kyanite and Mullite: Synthetic mullite by both the fused and sintered method is now being produced by plants for their own use. There is at present under way in the Bureau's Norris Laboratory an investigation to determine tolerances to iron, titania, alkalis and alkaline earths with

respect to the physical properties of mullite-bearing materials. On the basis of this work present specifications can be reviewed and revised if found to be unrealistic.

Lead-Zinc-Cadmium: The Bureau of Mines entered into a co-operative agreement with a private company to conduct pilot-plant tests for the caustic leach electrolytic zinc process devised by the Bureau for utilizing hitherto little used deposits of oxidized zinc ores.

The results of an investigation still progressing, appear to prove that geophysical resistivity surveys can be substituted to some extent for churn drilling in the Tri-State district as a means of discovering and delimiting a certain type of favourable prospecting ground. The largest number of D.M.E.A. contracts are in the lead-zinc commodity field. There are 120 of these exploration projects being carried on. The cost of these totals \$7,770,820.

Magnesium: A Bureau of Mines magnesium research programme is being conducted to determine the physical properties of magnesium when alloyed with other light metals such as aluminium and lithium. This investigation includes a fundamental study of phase changes which occur with various heat treatments and ageing cycles and the resulting changes in physical properties of the various alloys.

Manganese: Four D.M.E.A. manganese explorations are continuing at a total cost of \$269,764.

Mica: The Bureau of Mines is co-operating with industry in the development and evaluation of synthetic mica products to replace strategic qualities and grades of mica. The production of manufactured mica insulation from scrap was begun by General Electric Co. early in the year. It is expected that this and other industrial installations ultimately will obviate the need for mica splittings, and that micro film glass capacitors will supplant a part of the requirements for capacitor mica, hence the emphasis in current investigations is in exploring the potentialities of synthetic mica to replace the higher qualities of natural mica capacitor film.

Secondary Metals: The Bureau of Mines is carrying on a research programme to develop new metallurgical methods and techniques for the recovery and refining of non-ferrous metals from secondary drosses, residues and scrap metals. Success has been achieved in a number of the projects and promising results have been obtained in others. Vacuum distillation of molten metals has been used successfully for the separation of pure metals from both base and light metal scrap alloys. A number of modifications in the general vacuum process show definite promise for the recovery of aluminium from scrap materials by low pressure catalytic distillation which occurs at relatively high rates of distillation and correspondingly low temperatures. Extraction of aluminium from crude alloys by leaching with pure condensed liquid zinc at reduced pressure has also been successful. A molten-metal centrifuge was developed for investigating the use of centrifugal force for separating scrap alloy constituents. More than half of the alloys tested showed that metallic recoveries were better than 90 per cent of theoretically perfect separations. This method has definite possibilities

in the tin refining industry for the removal of iron impurities from molten tin.

Another activity of the section is a general thorough study of the process of selective oxidation in which a crude or contaminated metal melt is subjected to oxidation in order to form an oxide dross of the contaminants.

Selenium: Encouraging results have been obtained under the Bureau of Mines programme to investigate means of increasing selenium recovery. Producing companies have taken a marked interest in the programme, and recovery of a substantial part of the selenium heretofore lost in treatment operations would appear to be a logical outcome.

Talc: Research by the Bureau of Mines on substitutes for natural block talc are progressing favourably. In addition to the work on synthetic mica ceramic insulators, the Bureau is also investigating chemical bonding of ground pressed talc to produce a machineable dielectric comparable to natural block talc. Although industry has developed a number of pressed and extruded dielectrics, there is still a need for block talc until substitutes have been fully proven.

Tin: Research on volatilization of tin from Bolivian ores (in search for a cheap and effective process for treating lower-grade material) continued throughout the period in three laboratories of the Bureau of Mines, but as yet without pronounced success. The Bureau of Mines at Albany, Oregon, continued to produce pig tin from copper-tin scrap obtained from operations of the Atomic Energy Commission at Richland, Washington.

Titanium: At the request of Army Ordnance, 4½ tons of special high purity sponge titanium was produced in the Bureau of Mines' pilot plant by the use of special purification techniques. Work on the design and operation of a continuous reactor to replace the batch reactors used in the present commercial process was continued. Two titanium flash suppressors, two titanium muzzle brakes for use in heavy guns, and eight mortar base plates were prepared by the Bureau of Mines using new fabrication techniques of roll flanging and stretch forming, with final assembly completed by welding. Other research programmes include studies on electrodeposition, galvanic and chemical corrosion, and melting and fabrication techniques.

Reports of Investigations published during the reporting period describing various aspects of titanium research programmes are as follows: Investigation 4826, "Zirconium-Titanium System: Constitution Diagram and Properties"; Investigation 4835, "Explosive Characteristics of Titanium, Zirconium, Thorium, Uranium, and their Hydrides," summarizing results of a study, the major part of which was made in co-operation with the Atomic Energy Commission, on explosive properties of metal powders; Investigation 4837, "Removal of Magnesium and Magnesium Chloride from Titanium Sponge by Vacuum Distillation."

Tungsten: D.M.E.A. stimulated search for tungsten deposits. Thirty-seven projects involving this rare element are active, with a total cost of \$1,675,411.

Uranium: Fourteen D.M.E.A. exploration contracts for uranium are in force. These total \$488,429.

Strand Ropes—Winding, Haulage and Crane

By RICHARD SAXTON

Though many different constructions are available for hoisting purposes, the main object with all wire ropes is to confine within safe limits the combined bending and tensile stresses, to fabricate with units as large as possible, and maintain essential flexibility. In general, the type or design most suitable is found in the ratio which the diameter of the wires bears to the diameter of the pulley or drum on which the rope must function, as this directly affects both bend stress and flexibility.

Winding ropes, as employed in mines, may be classed in five groups, with round strand as the first and locked coil fabrications as the fifth. In between are various types of flattened strand and multiple non-rotating flat strand, designed chiefly for rapid hoisting in deep shafts. In group one (round strand), for small diameter ropes, a construction of 6 strands comprising 7 wires each, 6 over 1, is general, but for ropes over 1 in. in diameter, the Seale construction is generally recommended, particularly where more than 6 outer wires are included in the design. In this construction the strands have two layers of wires round a centre, the outer and inner layers consisting of the same number of wires, with the outer units lying in grooves between inner. Thus they are consequently in line contact throughout, with a resultant elimination of cross-cutting.

FACTORS OF CONSTRUCTION

Endurance tests demonstrate the remarkable improvement in service this construction furnishes. Construction is usually up to 1 in. diameter, 6 strands each, 6 wires over 1; 1½ to 1¼ in. diameter, 6 strands each, with 7 or 8 outer wires; 1½ to 1¼ in. diameter, 6 strands each, with 9 or 10

outer wires; and over 1½ in. diameter, 6 strands each, 12 or more outer wires.

Employing wires 1½ in. or over, fabrication involves the use of very small wires for the inner layers, so what is termed Modified Seale is usually adopted; that is 6 inner wires of the same diameter as the 12 outer, and 6 filler wires. Best manila is employed for main centre cores for this group in a diameter sufficient to support outer strands without permitting too close contact with adjacent strands. Main cores are usually constructed of flexible fibre which forms a soft bed for the strands, thus preserving the shape of the rope under strain and stretching with the rope without injury. In winding ropes the core should be of hemp, manila or sisal, but in haulage ropes cores of jute, cotton and other fibres are employed. Since all these fibres are hygroscopic and may also contain certain mineral salts, care has to be taken in their preparation.

When a new strand rope is first placed under tension, there is a short period of rapid stretch, due to the various strands and units settling into position. This is normal, and gradual stretch occurs during the whole period of effective rope life, until a point is reached at which stretch again becomes rapid. This is a warning to withdraw the rope from service. The stretch may be defined as of two types; constructional and material. Of these, constructional may be divided into two main causes, first, the compacting of strands on core and second, compacting of units on strands.

Under tension the rope transmits itself into a radial compressive load of the strands on the core, causing these to seat themselves more tightly, slightly reducing diameter, and increasing rope length. The constructional stretch due to compacting of the wires is also a direct cause of the

development of radial pressures of the outer and intermediate layer of wires towards the strand axis, as the rope is subjected to a tensile load. Applying a load to a 6 x 19 fabrication of approximately half the rated breaking strength, the rope will show a stretch of approximately 0.2 per cent to 0.3 per cent, and for a 8 x 19 rope tensioned to half strength the values equal 0.3 per cent to 0.6 per cent.

THE MODULUS OF ELASTICITY

A reference to stretch would be incomplete without mention of the modulus of elasticity, which may be defined as the ratio of applied load to resultant stretch, or as the ratio of stress to strain for stresses below the elastic limit, which on steel ropes is equal to a load equivalent to 60 to 65 per cent of the rated rope breaking strength. Formula generally employed to figure the modulus of elasticity is:

$$E = \frac{P \times I}{A \times d}$$

P = applied load on rope in lbs.

I = original rope length in inches.

A = metallic cross-sectional area of rope in sq. in.

d = change of length of rope in inches when subject to a load of P lb.

The subject of what value to give the modulus of elasticity has been investigated by Professor Hrabak. The modulus of a rope is quite different from that of a single wire, and Hrabak shows that in the case of the wire in a rope of round strand construction, a modulus should be taken of 0.44 of the modulus suitable for a single wire. The modulus for a single straight wire of plough quality steel is equal to approximately 28,500,000 lb. per sq. in., giving a value to the wire in the rope of $0.44 \times 28,500,000 = 12,540,000$ lb. per sq. in. It should not be overlooked the modulus appropriate to the different fabrications may be within fairly wide limits.

STRAND HAULAGE ROPES

Strand haulage ropes are usually fabricated in the same designs as winding, but generally with larger diameter wires. The only difference is that winding ropes are constructed of best acid or special acid steels, whereas the bulk of haulage ropes are fabricated of basic quality. The construction or fabrication most suited to haulage purposes is usually determined by the conditions under which the rope must function, and to obtain maximum service, the general practice is to construct it with outer wires of as large a diameter as possible, consistent with size of pulleys or sheaves and speed of travel.

One of the most serious defects to which a haulage rope is subject is friction, as apart from the cost of rope maintenance there is usually an increased cost in power charges. Actual loss is difficult to measure, and can only be approximately determined from a comparison of conditions of work. A further cause of deterioration is corrosion, due in many cases to rope fouling a floor, particularly on inclines. Lubrication during service is of value in preserving units from this defect, but practice varies with working conditions, as where endless-rope haulage is the rule lubrication is frequently omitted, on the grounds that it is liable to cause slipping of attachments. In the design of any type of haulage rope a knowledge of certain data is essential before fabrication can take place. That is: nature of working (endless-haulage or main-and-tail); maximum load; gradient of incline and speed at which rope is required to travel.

Strand crane ropes are produced in practically the same designs as those for winding and haulage, but with greater

flexibility, due to the smaller pulleys and drums on which they must work. In the fabrication of this class, factors to be considered are the bending stresses involved in bending round the smallest radius in the working system; the nature of acceleration and deceleration of load; and the factor of safety, for which, in the regulations laid down by the Factory Acts 1937 (Sub-Section 32), the Home Office recommends a figure for safe working not exceeding one-sixth of the actual breaking load of the rope.

As stated previously, the solution of the problem of design is to be found mainly in the ratio which the diameter of the units employed in construction bear to the diameter of the pulley or drum, and this ratio directly affects both bend stress and flexibility. For large winding ropes in mining, the ratio of 1/1,200 is common practice, but if applied to engineering ropes such a ratio would require pulleys and drums of unwieldy dimensions, and a study of British Standard Specifications for Crane Ropes (Specification 302), furnishes a ratio of 1/345 for tensiles up to 110 tons per sq. in., and 1/405 for wire tensiles in excess of this. These figures are obtained by multiplying the minimum diameter of pulley recommended in the

specification by the ratio $\frac{\text{diameter of rope}}{\text{diameter of pulley}}$ which, in the case of a 6/19/1 construction is approximately 15.

SPEED AND FILING ACTION

The question of speed also enters into the subject, and it is found in practice that strand crane ropes, working with a comparatively slow speed, will run efficiently over pulleys of much lesser diameter, than ropes running at a relatively high speed. This feature is dealt with in the B.S.I. specifications by a recommendation for an increase in pulley diameters for speeds in excess of 120 ft. per minute.

An imprint of the rope in the pulley groove means that there is a filing action on the rope at every start and stop. Where rope radial pressures exceed the hardness values of the groove material, indicating the inability of this to support the pressure, the rope will imprint its external shape in the groove material, thus inducing a filing action on the rope where a tendency exists for the pulley to slip by the rope. In addition, when a new rope is installed, there usually occurs a slight variation in rope lay or pitch. This new pitch will not fit the imprints previously made in the groove, and unless they are eliminated, rapid wear of the rope will take place. These variations in rope lay are not only found between ropes of different producers, but also in ropes fabricated on different laying or closing equipment of the same producer. The occasional touching-up of pulleys to maintain smooth groove walls is an economic practice.

Unless a wire rope is supported by the bottom of the pulley groove, there is side pinch of the rope during travel over the pulley, and an uneven distribution of the applied load between the several parts of the rope. Poor rope seating may be due to incorrect original grooving, or to a groove worn by a smaller rope. In installing a new rope it is always good practice to gauge both rope and U grooves within all pulleys and drum of the equipment. If the groove diameter is less than the actual caliper diameter of rope, crushing and decreased rope life will result.

Lang's lay[®] furnish a longer life over small pulleys than ordinary strand of identical grade and construction, but have one definite disadvantage; a decided tendency to unlay. A rope of this fabrication should only be employed where both terminal ends of rope are fixed, and should never be used for a spinning load, or with swivel terminal. Its resistance to crushing or distortion is also materially less than that of ordinary strand fabrication.

Géomines Hard Rock Mining Operations

The Compagnie Géologique et Minière des Ingénieurs et Industriels Belges, more familiarly known as "Géomines," is the leading tin producer in the Belgian Congo. Its principal deposit is at Manono in the Katanga region where the cassiterite is found as small grains in the altered pegmatite as well as in the hard rock underneath. These deposits are fairly localized, thereby lending themselves to modern methods of mechanized development but until 1950 operations were confined to working the soft kaolinized tin-bearing pegmatite. A brief description of Géomines' operations in the altered pegmatite was given in our issue of August 24, 1951, and the following article deals with the company's operations in mining the hard rock underlying the tin-bearing pegmatite, a summary of which was reported in *U.S. Mineral Trade Notes* Vol. 34, No. 3.

The transition of the Géomines operations from mining soft kaolinized tin-bearing pegmatite to mining the hard underlying material has been gradual. So far only one pit has been opened in the unaltered rock, in the company's Kitotolo section and operations in the Manono section are still being carried out in the soft altered pegmatite and are capable of yielding an annual output of 2,500 tons of cassiterite for several years.

The new plant to treat the hard ore began operations early in 1950 on an experimental basis. The recovery process is more or less standardized and consideration is being given to extending the operations, and thus increasing production. Initially, considerable difficulties were encountered, but it now appears that the new techniques promise complete success.

HIGHER VALUES FOUND IN THE HARD ROCK

One of the most encouraging developments in the hard rock mining has been that the tin content is around two kilogrammes per cu. metre, which is better than that found in the kaolinized ground. But drilling in the hard pegmatite has proved to be one of the most difficult problems to solve, which has been accentuated by the shortage of nickel steel for churn-drill bits. At present the drilling equipment consists of eight Bucyrus-Erie units and six "Quarrymasters." However, it is planned to standardize the Bucyrus-Erie units for the proposed expansion programme, which will require fourteen new machines for Kitotolo and one for Manono.

A high-explosive "cheddite" is used for blasting. This explosive was developed by Union Minière at Kakontwe. Split charges are used, with two-thirds of the charge below the intermediate stemming and a third above; primacord detonates the charges. A good deal of secondary blasting is needed, but, with the long pit face being worked, this does not delay operations as the shovel can load at one point while secondary drilling is done at another. Explosives consumption, presumably in both primary and secondary blasting, was reported at 350 grams per cu. metre. An explosive plant was built by Société Africaine d'Explosifs (Afridex) at Manono, about 2 kilometres west of the west end of the runway of the airport. Around 70 tons of explosives is being produced monthly, using sodium chlorate as the principal ingredient.

CLEARING AND TREATING THE ORE

The broken ore is loaded into 20-ton trucks by electric shovels having 6-cubic metre buckets. Three units are in operation and three additional shovels will be needed to increase output to 600 tons per hour at Kitotolo. Ten units will be required for the proposed hard-rock operation at Manono for an hourly output of 1,000 tons. The trucks dump the ore directly into a pit in the floor of the open cut at Kitotolo. There is no grizzly but the muck falls directly into the mouth of the 30-in. gyratory crusher through a hopper. The feed contains a large quantity of fine material and, as the crusher motor is only 150 h.p., chokes are frequent. Plans call for installing a 325 h.p. motor on the crusher and in the future call for a much larger crusher. Two will be required for the expanded

operations at Kitotolo and Manono. To prevent chokes from the fines, a revolving chain-grizzly with 1 centimetre openings is to be installed. Excavations have been begun for a second crusher hopper at Kitotolo, which will permit the installation of a larger unit and also reduce the truck haul from the shovels to the crusher.

A new conveyor belt, 120 mm. nylon rubber, 3,500 metres long, will be used. To prevent excessive wear on the belt, it will be fed by another one that receives the discharge from the primary crusher. The -100 mm. product from the primary crusher is reduced to -40 mm. by a secondary cone crusher, and then to -6 mm. by third-stage crushing, also using cones. The management estimates that seven secondary crushers and 30 tertiary ones will be needed for the 20,000-ton programme, with a provision for necessary spares. The final grinding is in 9 x 11 rod mills, two of which are in service with 14 more to be required. It was necessary to change the ball-mill feeds from end-feed to centre feed to prevent wear only on the end of the rods. For screening between the secondary and



A modern installation at Manono

tertiary stages 62 rod screens will be required and six grizzlies will be needed at the top of the additional secondary crushers.

Eighteen Denver jigs are in service at the Kitotolo plant, fed from the rod mill discharge through a 400 ton storage bin. Plans call for installing 54 additional screens and 76 at the proposed Manono plant. Fifty Symons screens will be needed for separating the +1 mm. material discharged from the jigs in addition to the six now in service. The -1 mm. material from the screens goes to a 50-ft. Denver rake classifier. Another one will be required for new installation. The thickened pulp is treated on 40 shaking tables, and the concentrates are given a final clean-up on eight tables. Other equipment needed will include 12 Denver sand pumps, 8 x 6.

Water consumption in milling the hard rock is 3 cu. metres per cu. metre of ore, of which 60 per cent is reclaimed in the Denver thickener. Plant recovery has been around 90 per cent, and it is expected to eventually exceed 96 per cent. By the end of 1951, 600 tons of cassiterite was recovered from hard rock mining.

It is believed that Géomines is interested in the possible use of heavy-media separation. This process will be suitable for use by Géomines and will permit the elimination of so many jigs and tables.

Improved Shuttle Car Haulage Safety

The following article is condensed from a circular of the same title issued by the United States Bureau of Mines, which was based upon suggestions and recommendations submitted by more than two hundred Federal coal mine inspectors stationed throughout the bituminous coal producing States of the country. The author of the completed report, Mr. D. S. Kingery, is chief of the Haulage Section, Coal Mine Inspection Branch, of the U.S. Bureau of Mines.

The widespread acceptance of shuttle car haulage by the American bituminous coal mining industry has been rapid, for within fourteen years this type of traction has become so prominent that approximately 50 per cent of the mobile loading machines now in service in that country load into shuttle cars. This innovation in face haulage methods has reduced some hazards common to track haulage, while on the other hand it has contributed others inherent in shuttle car operation.

The frequency rate of injury through accidents appertaining to shuttle cars is approximately twice that of all bituminous coal mine accidents, and this factor indicates the need for the study and application of corrective measures which could assist in reducing these mishaps.

CONTRIBUTORY FACTORS

Investigations reveal that mishap may be caused by shuttle car roadways of inadequate width or by roadways where timber legs protrude into the haulage way. Other roadways used for shuttle movement contain holes, ruts and similar irregular conditions, and such roadways are usually poorly drained.

Irregular coal ribs with excessive overhang are an additional contributory factor, while check curtains installed at narrow points, at jutting brows or at entrances to breakthroughs play a part in maintaining the present shuttle car accident rate. Unsuitable timbering systems increase the hazards, as does the attempted use of shuttle cars which are too high for the height of coal. Makeshift car unloading ramps or discharge points that lack adequate lighting or headroom and are without safety features such as stop blocks or ramp cleats contribute to the overall situation, as do unsuitable mining plans which utilize sketchy mining control and lax supervision of operations.

Apparent deficiencies in the maintenance and design of the shuttle cars themselves are an obvious factor in the maintenance of undesirable features on the haulage way. Deficiencies of brakes, steering mechanism or lighting systems are worthy of primary consideration, while a lack of auxiliary brakes on cars is an important factor. An exposed space for the operator, uncomfortable and requiring a strained posture, promotes tiredness and a subsequent reduction of control efficiency. The lack of audible warning devices and the hazards of protruding boxes or corners that catch against timber sets and check curtains complete the deficiencies apparent in the design of the shuttle cars themselves.

In part, these deficiencies of design lead to certain hazardous practices which are common in shuttle car operation. The matter of posture is important, for the driver can be placed so that he does not face the direction of travel while in addition he is exposed or not completely seated. Other hazardous practices of operating personnel include jumping off moving equipment, horseplay on or near shuttle cars, and the use of shuttle cars by unauthorized or inexperienced personnel. Cars driven at speeds which are excessive for the physical condition of the travelways and the failure to sound audible warnings or to be mentally alert while approaching check curtains, doors or workers are further contributory factors.

To counter these existing hazards, the report puts forward recommendations for the safe working of shuttle cars by the operators, as well as certain features to improve physical conditions in the mines and in the design of shuttle cars themselves. As in all underground work,

safety depends upon a co-ordination of man, machine and natural forces.

In shuttle car operation, each driver should be trained comprehensively in his work during a period spent either on surface or underground, and once this period is completed he should begin each underground shift with a complete check of his vehicle. He should make a trial run through the section of operations, observing any changes from his previous shift and noting carefully any likely hazards. At all times, both during the trial run and during his operations for the day, he ought to face the direction of travel except when manoeuvring behind the loading machine. No worker ought to be permitted to move or operate a shuttle car save the operator or experienced personnel expressly designated to the task.

During actual loading operations cars should not be pushed or bumped by the loading machine and a standard code of audible signals between shuttle car and loading machine operators should be established and practised. An operator must remain seated during loading, with complete and alert control over his car.

This condition needs to be observed also while the vehicle is in motion, and on no account should an operator descend from a car while it is moving. Naturally, the period of actual mobile operation is the time when the majority of hazards exist, and an operator trailing another shuttle car should maintain a distance of three car lengths to allow for sudden braking. He should approach any intersection or obstruction with caution and sound an audible signal and should never exceed a speed of 4 m.p.h., although his actual speed is obviously governed by visibility, obstructions, and the conditions existing on the traffic way. He should ensure that all persons are clear of his vehicle and ought to sound an audible signal before setting into motion, and observe a commonsense rule of the road by not attempting to pass anyone on curves. When materials are hauled on shuttle cars, a locking device should be installed to prevent accidental movement of the flight chain. Special attention ought to be given to the timbering of shuttle car intersections.

ANCILLARY EQUIPMENT

Ancillary equipment is worthy of attention, and shuttle car unloading ramps of solid construction, considerably wider than the distance between wheels and provided with cleats, curbs, and a preventative block, would be of consistent value. Shuttle car discharge points ought to be well lighted, but power wires at unloading stations should be installed in such a manner as to prohibit the possibility of contact with shuttle cars or operators.

The features recommended include the realization that all shuttle cars should be provided with audible warning devices and that cable reels of hydraulic type would prolong the life of trailing cables. It is further suggested that some type of electrical control unit be installed to prevent contractors from operating when a wrong splice is made and polarity reversed. Shock absorbers would prevent excessive cable strain and aeroplane type disc brakes would be an improvement over the motor car type.

Lighting receives special attention, with the recommendations forwarded that shuttle cars be equipped with dim lights for use during loading, headlights at each end of the shuttle car with automatic transfer to the direction of travel, and that a maximum light would be reflected were the car painted a distinctive colour.

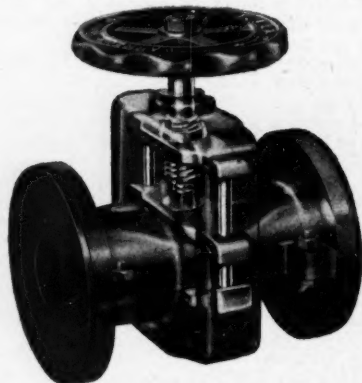
MACHINERY AND EQUIPMENT

A Valve for Handling Abrasive and Corrosive Fluids

Operating on the pinch valve principle and designed mainly for the handling of abrasive and corrosive fluids, the Warren, Morrison Ltd. valve consists of a rubber tube, with end flanges and a clamping mechanism enclosed in a metal body. The tube is thus virtually a flexible lining which provides a direct and full bore flow. Its applications within the mining industry are easily visualized as being of service in reduction plants and similar installations.

Flanges are drilled according to requirements with sizes from $\frac{1}{2}$ in. bore to 2 in. bore in production, and only flanged valves are available from the manufacturers. The advantage of these types of valve are claimed to be that corrosion or erosion wear is minimized and that the sole part affected is easily replaceable. In addition, tight closure is obtained when liquids are handled which contain small solids in suspension. The manufacturers state that the valve cannot stick, and that when thick slurries or sludges are handled flow resistance is reduced and the chance of clogging is remote.

The tubes mentioned are available in several grades of natural and synthetic rubber to handle a wide range of acids and other corrosive chemicals as well as abrasive pulps. For these abrasive applications, tubes normally are supplied in Linatex rubber which



The internal mechanism of the Warren, Morrison Valve

will close over small particles without damaging the valve besides enjoying a greater resistance to erosion. The clamping mechanism on the 2 in. and larger sizes closes the tube from the top only. Working parts are of brass and of gunmetal and the valve body normally is of aluminium although other metals can be supplied.

Signalling on Underground Man-Haulage Systems

The efficient transportation of miners between pit bottom and working face saves time and sustains morale. Of particular interest in this connection is an enterprising booklet, *Engineering Bulletin 2310* from the Automatic Telephone & Electric Co. Ltd., which deals with signalling systems for use on rope-driven and locomotive-haulage systems.

Intrinsically safe signalling systems installed by the company comply with all stipulations of the Coal Mines Act. Present A.T. & E. practice uses intrinsically safe relay groups and incorporates a full wave rectifier, so that the apparatus may be operated from either A.C. via a certified transformer or direct from a suitable D.C. source.

The A.T.M. mine signalling system for rope-driven man-haulage, Type 48, is described in detail. The system, designed primarily for use with underground endless-rope man-haulageways on which a number of trains may be operated simultaneously, provides for audible and visual signals to be sent manually from the trains to the winding engine.

At one colliery this system provides for six trains over a run of 4,500 yd., with the overhead bore signalling wires divided into

six electrically separate sections of 750 yd. each. Armoured cable is run along the haulage way and is tied into the bare wire circuit at each section point. A group of mine telephone type relays mounted on a jack-in base is associated with each signalling section. The relays are designed for low current operation from a certified transformer and full-wave rectifier. An emergency stop feature is ready for immediate operation.

The A.T.M. conductor-to-driver signalling system, Type 48, is another system designed to provide communication on loco-hauled trains, where the conductor may be at any fixed point on the train and an emergency stop is provided.

A group of eight telephone type relays provide the facilities with the apparatus mounted on a jack-in base which is carried on the locomotive. The equipment is operated from a 24-volt dry battery, also carried on the locomotive, and each signal indication is given by two 6-volt, 0.04 Amp. M.E.S. lamps wired in series, and suitable resistors are incorporated in the relay group to drop the voltage from the battery.

The Wolf Rock Lighthouse Crane Post

The possible applications of mining equipment and techniques to the demands of civil engineering practice was demonstrated on July 14 when Messrs. Holman Bros. erected a new crane post on the Wolf Rock, off the coast of Cornwall.

The post is an iron mast weighing $2\frac{1}{2}$ tons and standing 26 ft. in height, contained in a hole $7\frac{1}{2}$ ft. deep and 2 ft. in diameter. The erection operation demanded that the containing hole be drilled in the Wolf Rock lighthouse jetty, and as no blasting was permissible owing to the close proximity of the lighthouse itself, a series of holes were drilled in each round and these were then broken into each other by a road ripper.

After consultations between Trinity House and Messrs. Holman Bros. the following equipment was used for the task: a T 13 D compressor, a Silver Bullet handrail of $4\frac{1}{2}$ in. shank with 1 in. hexagon steel using Holbits, and a SS 33 road ripper with plugs and feathers. These equipments were all Holman-produced, and the firm also evolved two special tools for the task.

As the situation on Wolf Rock presented extreme difficulties, the possibility of mistakes was eliminated by a period of four weeks of special training at the Holman test mine for the operators concerned. Here they were given special training in the use of rock drills, and a hole 6 ft. 6 in. in depth was drilled in the solid granite of the mine. By this means every aspect of the Wolf Rock operation was rehearsed, and there were produced the two new tools mentioned, a scoop for rubble clearance from the hole bottom as depth increased, and a piece to guide the drill steel around the bottom of the hole after a depth of 3 ft. had been reached.

In the actual operation, the compressed air drive for the drills was supplied by pipeline from the T 13 D compressor which was set in the hold of a fishing boat anchored some distance away.

Winding Equipment for the N.C.B.

A National Coal Board contract for two electric skip winders of 3,700 h.p. with all control and protective gear has been entrusted to the General Electric Co. Ltd. The winders are destined for two collieries of the North Eastern Division, the Silverwood East and the Cadeby Main, both in No. 3 Area.

G.E.C. cascade exciter control scheme, a method of energizing the field of a generator so that the excitation can be varied or reversed with minimum time lag and by the expenditure of little energy in the initiating circuit, has been adopted in the equipment to ensure speed of response with high stability. In the instance of the units supplied for the National Coal Board contract, the exciters are used in conjunction with Ward Leonard control. They provide the excitation for the field of the generator supplying the main winder motor.

Operational performance shows that each winder is designed to raise 528 tons of coal per hour from a depth of 2,299 ft. Twin parallel drums of 18 ft. diameter driven through reduction gearing by an 0-320 r.p.m. D.C. motor are fitted to each winder. A 2,650 by an 0-320 r.p.m. D.C. motor are fitted to each winder. A 2,650 kW Ward Leonard set driven at 500 r.p.m. by an 11 kV synchronous motor provides the 0-600 volts D.C. supply for the motor.

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Established 1835

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REVIEWS

The Geology and Mineral Resources of the Neighbourhood of Kuantan, Pahang.—By F. H. Fitch. 10½ in. × 7½ in., 144 pages, illustrated with four coloured geological maps, scale 1 in. to a mile, and horizontal sections. Price \$6, Straits. Obtainable from the Director, Geological Survey, Batu Gajah, Malaya.

Much of the fieldwork on which this interesting report is based was carried out by the author prior to the Japanese invasion of Malaya in 1941, and during this period, and later, after the re-occupation, he was helped by field assistants, six Malays and one Chinese. Two of the Malays died under the 3½ years of Japanese rule, and one of them Che' Yeop bin Uda Rasit will long be remembered by his friends in the Geological Survey Department if only for his ability to find fossils where others could not. Even after nearly 50 years of geological investigation not many localities are known in Malaya where the rocks are fossiliferous, but a large collection has been made in the Kuantan area and identified by the staff of the British Museum (Natural History) in London. This enabled big alterations to be made to the Kuantan reconnaissance geological map of 30 years ago and large areas of shale then mapped as Trias are now shown in the author's maps as Lower Carboniferous. Indeed, the author expresses some doubt whether he is correct in retaining some smaller areas still shown as Trias. Although lithologically they resemble the arenaceous series known to be Trias in other parts of Malaya, yet here, in Kuantan, they also may turn out to be Lower Carboniferous; future work in the State of Trengganu immediately to the north will probably resolve the doubt one way or the other.

Most of the area is covered with dense jungle. Much of it is mountainous, and other parts are swampy, so the geological mapping was done only after the expenditure of great physical effort under conditions of considerable discomfort. It is not surprising, therefore, that in spite of all that has been done, the traverse-plan (fig. 2) shows that there are still tracts of country several miles across that have not been examined, and as the mineral possibilities of the Kuantan area are large, it is clear that geological work and prospecting should continue for many years to come.

The Kuantan area is specially important because here are the mines of the Pahang Consolidated Co., which are amongst the largest producing lode tin mines of the world. Thanks to the company's willing co-operation, the author is able to include a full and authoritative description of them in this report. Since the year 1888 they have produced 80,000 tons of tin concentrates valued at £10,000,000, and in an area of 6 sq. miles at Sungai Lembing and within a depth of 2,000 ft. below the surface the company has undertaken more than 180 miles of underground development. Altogether there are 350 sq. miles of concession held by the company and tin concentrates have been mined from alluvial and eluvial deposits in a number of localities at some distance from Sungai Lembing. At Sungai Lembing the lodes occur in shale and seem to be located within a distance of 2,000 ft. from granite, and the author says (p. 110) that it is now necessary to determine the depth of the granite below the surface beyond the limits to which development has already been carried. The object of this is to find localities where the zone of potential mineralization is sufficiently shallow to justify underground prospecting. This depth to granite could best be determined by geophysical methods. The Pahang Consolidated Co. Ltd., has given great facilities to the author to enable the publication of this important report which includes plans and projections of the underground workings. The author emphasizes the need to ensure that geological investigation shall continue.

E.S.W.

Dana's Manual of Mineralogy, Sixteenth Edition.—Revised by Cornelius S. Hurlbut, Jr. Published by John Wiley & Sons, Inc., New York, and Chapman & Hall Ltd., London. Pp. 530 with illustrations and index. Price 48s.

The work under notice is a clear presentation of the Dana system, with the added value that previous standards are excellently revised and that everything possible has been done to cover the latest developments in mineralogy. The Dana crystallographic nomenclature has been abandoned. Other benefits of the work include a simplified introduction for the beginner, and an improved chapter on the chemical aspects of minerals.

Fluorspar: Vol. IV of the Memoirs of the Geological Survey of Great Britain.—By K. C. Dunham, B.Sc. and others. Published by H.M. Stationery Office, 1952. Price 17s. 6d. net.

The first edition of this report was issued in 1915, and reprinted in 1917. The third edition was published in 1922, and the present fourth edition bears date 1950. The industrial history of fluorspar may be said to date from the beginning of the century when it was introduced into the basic open-hearth process of steel manufacture to assist slag fluidity and de-sulphurizing of the charge. This has remained the principal avenue of consumption, later enlarged by extension to the electric furnace processes of steel manufacture. In the United States the chief consumer of fluorspar, the steel industry, is responsible for about 60 per cent of consumption. Apart from metallurgical requirements, there is a considerable consumption of the mineral for the production of acid.

While the principal objective of this memoir is no doubt to present geological and mining data regarding deposits in Great Britain accumulated over a long period, a somewhat incomplete statistical sketch is attempted of world production. Fluorspar is a mineral, the production of which has fluctuated materially in recent years. The memoir gives annual world production around 600,000 tons. Details are given of world output for 1944, taken apparently from the *Minerals Yearbook*, which gave a total of 1,036,000 tonnes. According to the same authority, the figure for 1948 was 796,000 tonnes and for 1949, 660,000 tonnes; probably, with the big increase in steel production in the United States in 1950 and 1951 (of which we have not yet received statistics), it was considerably larger.

For the most part the memoir draws upon the Westwood Report for its information regarding Great Britain. That Report cautiously estimated reserves in the United Kingdom at some 500,000 tons of saleable grades of fluorspar with an additional 500,000 tons as possible ore, the whole equivalent to some 15 years' supply at an annual consumption rate of some 65,000 tons, but they admit that there was insufficient evidence upon which to form a reliable estimate, and they add that the position cannot be regarded as anything but serious.

Hydrofluoric acid shows a steady expansion in use, notably in the light metal industry and in the preparation of artificial cryolite, essential in the electrolysis of alumina to produce the metal. It is also employed as a catalyst in the alkylation process for producing high-octane petroleum.

Directory of Indian Mines & Metals.—Compiled by P. K. Ghosh. Published by the Mining, Geological & Metallurgical Institute of India. Pp. 208 and illustrated by maps and photographs. Price Rs. 15.

In a foreword, Mr. D. N. Wadia, President of the Mining, Geological & Metallurgical Institution of India, points out that a directory of Indian mines has for long been a sorely felt need. The most essential statistics of the three thousand operating mines and quarries of the country were lacking, and the preparation of the work under notice will prove helpful to the mineral industry of India.

Included in these pages are such essential items as price lists, and grade analyses. Comprehensive notes detail the trend of the mineral industry in India, and all mined materials are dealt with in turn.

Sections of the work are divided under mineral headings as well as those of districts, and future trends in the mining industry of the country are contained in precise notes which tell of working methods, surface plant installations and like subjects. Administration, working conditions, health and safety are also discussed. A useful handbook for all those whose task it is to keep a close watch on mining in India.

Principles of Geochemistry.—By Brian Mason. Published by John Wiley & Sons, Inc., New York, and Chapman & Hall Ltd., London. Pp. 276 with illustrations and index. Price 40s.

The connection between geology and other sciences, notably physics and chemistry, is made clear in this concise work which is presented by the publishers as the first up-to-date textbook in this comparatively new field. Chapters give information on the earth in relation to the universe, the structure and composition of the earth, as well as geochemical discussions on igneous, sedimentary and metamorphic rocks. The work states the facts of geochemical experimentation in easily mastered principles for student use. A useful work.

METALS, MINERALS AND ALLOYS

U.S. holidays culminating in Labour Day at the beginning of this week, continued to make the metal markets sluggish and the approach of the Presidential elections does nothing to improve the position. A recent speech of Mr. Stevenson has, however, clarified his attitude towards labour relations. He is strenuously opposed to the Taft-Hartley Act, which was driven through despite Mr. Truman's opposition and remained unused even during the recent lengthy steel strike. Mr. Stevenson wants to have constitutional guidance on the question of Presidential intervention when voluntary agreement fails; although he believes in the system of voluntary bargaining he denies the right to extend this principle so far as to stop the national economy. Washington observers consider that Stevenson has made a great impression on the workers by this speech. There is, however, still a long way to go before the elections take place.

COPPER.—The situation regarding the strikes which have been threatening the U.S. non-ferrous mining industry still remains uncertain. Although Anaconda and A.S.R. have followed the example of Phelps-Dodge in reaching an agreement with the International Union of Mine, Mill and Smelter Workers, and on approximately the same terms, the Union negotiations with Kennecott have broken down and strike action is threatened. Moreover, A. S. & R. have yet to reach any agreement with the workers at their Garfield plant who are members of the United Steelworkers Union.

U.S. demand for copper, both domestic and imported, remains strong. Some U.S. producers are suggesting that domestic production could be raised 10-15 per cent if price control were to be dropped. Indications are, however, that Washington will persist with its policy of long term contracts and subsidies to marginal producers.

LEAD.—The Committee of the London Metal Exchange has announced new terms for the Lead Contract. The minimum contract is to be for 25 tons against 50 tons pre-war and the metal is to be of the standard purity of 99.97 per cent. With the large rise in lead prices since 1939 this reduction in the minimum trading quantity will remove what would otherwise have been an undue financial strain both on dealers and consumers.

Trading will take place in four settlement months, i.e., current month (October) and three subsequent months (November, December, January). Metal will be deliverable the following month; for example, October settlement lead will be deliverable between November 2 and December 3. To cover any immediate requirements dealing will also be permitted in prompt metal which entails delivery within five days if sold ex-ship or three days if sold ex-warehouse.

Official buyers' and sellers' prices will be issued after the morning session for the current month (October) and three months forward (January).

Following representations from some of the principal Australian producers the Federal Prices Minister has announced an increase of 46 per cent in the domestic lead and zinc prices. With effect from September 3, the price both for lead and zinc will be increased to consumers from £A.65 to £A.95 per ton. For their part, producers have undertaken to supply the home market with 80,000 tons of lead and 60,000 tons of zinc per annum. Despite this sizeable increase in the Australian domestic price, which is equivalent to £76, this is still some 30 to 40 per cent below the world price, so that Australian producers are still being asked to subsidize local industry to a considerable extent.

A Reuter report from New York suggests that the G.S.A. has so far purchased 26,000 tons of lead against its "civilian" stockpile programme of 30,000 tons which was initiated a little over two months ago.

TIN.—World tin smelter production for the first half of 1952 show a decline according to International Tin Study Group figures which give an output of 157,400 tons for this period compared with 166,000 tons for the corresponding period a year ago. This decline is principally accounted for by the low level of production at the Texas Smelter although Malaysian production also shows a decline of between 5,000 and 6,000 tons.

President Estensoro of Bolivia this week told a mass meeting of the Bolivian Workers Union, said to number 70,000, that these were the most critical moments of the National Revolution. Only

30 days remained before the Nationalization Commission must present its report and then nationalization of the mines would be put into effect. Nationalization of the mines was necessary because the nation needed their riches and because control of these riches must be taken away from Patiño, Hochschild and Aramayo. Referring, apparently, to last week's disturbances, he said no opposition, internal or external, would prevent nationalization.

No further progress has been made in Washington with the Bolivian tin negotiations which remain postponed at the latter's request.

ZINC.—Figures issued by the American Bureau of Mines indicate why the ending of the steel strike has not brought a great increase in the demand for zinc. At the end of May galvanisers held stocks of 38,260 tons plus 2,002 tons in transit. The zinc which galvanisers bought for June delivery is still being used and, until these deliveries are out of the way, demand is not likely to rise appreciably.

The U.S. zinc price remains steady at 14c. although demand has not been very strong. The market appears confident however that the demand will quicken in the autumn which would account for the price remaining unchanged.

Elsewhere in this column under lead we refer the increase in the Australian domestic zinc price.

ALUMINIUM.—The long-delayed proposal for Aluminium Ltd. to take an interest in the Japanese aluminium industry has come a stage nearer fulfilment by the president of the Japan Light Metal Co. leaving for New York. No official statement has yet been issued on the subject but it is understood that Aluminium Ltd. is to acquire a controlling interest in the Japanese concern for \$C.2,000,000 and will lend a further \$C.1,800,000 for eight years at 5½ per cent interest. Aluminium Ltd. is expected to provide technical advice and the Japanese company is thought to be preparing to develop Malayan bauxite mines. Several points of detail appear to be in need of settlement, but they do not appear likely to become stumbling blocks. The opposition of the Japanese Finance Minister to a Canadian concern acquiring so large a holding in an important Japanese industry, which had been a main point at issue, now appears to have been resolved.

Alcoa claims that its new aluminium alloy C57S holds promise for the motor-car equipment industry. The alloy which has an unusually bright finish has already been used for making fancy goods and for decorating refrigerators.

During the steel strike N.P.A. suspended the restrictions on the amount of aluminium and copper which could be held in stock. Consumers have been informed that they will be permitted to accumulate stocks up to 60 days' supply during the last quarter of the year.

Mexico is planning to establish an aluminium processing plant in the valley of the Papaloapan River. The hydro-electric power will be supplied from the nearby Presidente Aleman dam and presumably the ore will come from the central state of Guanajuato, though it would appear that transport of the ore will cause difficulties. Transport is not the only trouble, the ore is lacking in colour consistency and is not pure. Moreover, production has always been on a very small scale. The plant will cost 100,000,000 pesos.

WOLFRAM.—There is little fresh to report this week, prices remaining unchanged at 425s. c.i.f. buyers, 447s. 6d. d/d sellers, with a reasonable volume of business passing. The Spaniards are endeavouring to push up prices but the British Ministry sees no reason to advance their buying price since adequate supplies are coming forward from other sources, notably Burma. The Portuguese appear willing to talk business in terms of the Ministry's buying price. America is not undertaking any fresh buying but are taking deliveries under their long term contracts from various sources.

The Turkish Government have made repeated claims in the past month of the discovery of an important vein of wolfram at Uludag (Mount Olympus) in the north-west of Turkey. Assayed samples show that the new deposit contains 2 per cent wolframite. This compares with about 3 per cent which is carried by the rich Spanish and Portuguese deposits.

GOLD.—The output of gold in Western Australia appears to have fluctuated widely in recent months. In May the Royal Mint

at Perth received an abnormally high quantity of gold, 90,283 f.oz. The June receipts of 55,025 f.oz. were more in line with recent levels but the July figures rose again to 64,854 f.oz.

U.K. METAL & MINERAL IMPORTS—JULY

	Units	July 1952	Jan.-July 1951	Jan.-July 1952	Increase or decrease in 1952 over 1951
Non-ferrous metals and manufactures:					
Aluminium and alloys...	Cwt.	466,624	1,796,323	2,773,137	+ 976,814
Bismuth*	Lb.	41,362	334,953	401,288	+ 66,335
Cadmium	Lb.	25,760	848,710	1,105,262	+ 256,552
Cobalt and alloys...	Lb.	405,286	2,051,955	1,895,559	- 156,396
Copper:					
Electrolytic	Tons	24,305	136,647	132,313	- 4,334
Other	Tons	11,753	76,523	89,702	+ 13,179
Lead	Tons	3,777	71,079	95,919	+ 24,840
Mercury	Lb.	2,280	893,395	426,340	- 467,055
Nickel	Cwt.	15,624	55,847	74,641	+ 18,794
Tin	Tons	Nil	3,950	2,404	- 1,546
Zinc	Tons	30,184	66,209	138,839	+ 72,630
Ores and Concentrates:					
Antimony ore and conc.	Tons	1,666	14,751	14,448	- 283
Basalt	Tons	17,729	189,479	159,832	- 29,647
Chromium ore	Tons	11,806	85,670	106,408	+ 20,738
Iron pyrites†	Tons	47,415	176,801	275,766	+ 98,965
Manganese ore	Tons	24,448	226,576	248,174	+ 21,598
Molybdenum ore	Tons	7,669	26,224	46,775	+ 20,551
Nickel ore, conc. & matte	Tons	3,473	22,641	20,430	- 2,211
Tin ore and conc.	Tons	5,531	26,669	32,765	+ 6,096
Titanium:					
Ilmenite	Tons	2,970	57,049	67,411	+ 10,362
Other sorts	Tons	1,150	5,491	5,521	+ 30
Tungsten ore	Tons	891	2,426	4,803	+ 2,377
Zinc ore and conc.	Tons	10,420	85,628	91,042	+ 5,414
Non-ferrous metal mining products:					
Asbestos	Tons	10,897	66,786	72,441	+ 5,655
Magnetite	Tons	2,816	14,023	15,113	+ 1,090
Sulphur	Tons	51,265	241,518	266,087	+ 24,569

*Excluding bismuth alloys. †Including cupreous iron pyrites.

The London Metal Market

(From Our Metal Exchange Correspondent)

Tin has been a rather dull and uninteresting market since our last report, but has shown signs of greater activity in the last few days with a firmer tendency in prices as a result. The backwardation after contracting has widened again somewhat, and in view of the smallness of stocks of metal on warrant it would not be surprising if the premium for near metal over the three months' quotation were to increase still further. In the East demand has been well maintained and all offerings have been readily absorbed, and the market there has a very firm appearance. In Europe the demand for Straits tin already afloat continues and very good prices have been paid.

Consumer demand for lead has been small and it may be that although the holiday period is drawing to a close, stocks may be drawn upon pending the commencement of dealings in this metal on the London Metal Exchange on October 1. It will then be possible to purchase for the current month and the three following months' settlements. As deliveries against the third following month settlement takes place in the following month, consumers will be able to cover their requirements of physical lead up to approximately five months. Provision is also made for sales for prompt delivery by which means immediate requirements may be covered.

In Europe, copper and zinc remain dull with very little business passing.

On Thursday the official close on the tin market was: Settlement price £962, Cash Buyers £962, Sellers £963; Three months Buyers £949 10s. Sellers £950. In the afternoon the market was quiet. Turnover for the day was 110 tons. Approximate turnover for the week was 465 tons.

The Eastern price on Thursday morning was equivalent to £975 12s. 6d. per ton, c.i.f. Europe.

Iron and Steel

The American steel industry has achieved a substantial recovery since the stoppage and further expansion is foreshadowed in September. This ensures delivery of the promised 1,000,000 tons of U.S. steel to Britain before the end of the year although less than half that amount has thus far been shipped. Still more impressive is the expansion of shipments of Continental steel to U.K. ports. In July alone over 250,000 tons of iron and steel were received from overseas. Home production is

also rising rapidly and as we are not exporting as much material as we did last year, the increase in the net tonnage available for use in the British steel-using industries must be very substantial.

As yet the consuming industries, including those engaged on re-armament work, have experienced the full benefit of higher imports and greater home production. There is a time lag in these matters which will speedily be eliminated. Meanwhile, however, complaints of short supplies have not been silenced. As an example Midlands wagon builders complain that work is held up for lack of steel and shipbuilders are in a similar plight. However, the position is improving and by the end of the year or at latest in the spring the supply of iron and steel promises to overtake the demand.

Up to the end of July rather more than 1,000,000 tons of ore in excess of last year's total had been imported. Still more surprising is the fact that in the same month arrivals of foreign iron and steel scrap reached 95,178 tons. This is by far the heaviest monthly tonnage recorded this year and brings the seven months' total almost to a parity with last year's figures.

More amply supplied with pig iron, the steel makers are not disposed to make reckless use of this material. They are husbanding their stocks to cover a probable shrinkage during the winter months. Home scrap deliveries are also on a better scale, but pressure for further supplies is unabated.

SEPTEMBER 4 PRICES

COPPER

Electrolytic £285 0 0 d/d

TIN

(See our London Metal Exchange report for Thursday's prices)

LEAD

Soft foreign, duty paid £131 0 0 d/d
Soft empire £131 0 0 d/d
English lead £132 10 0 nom.

ZINC

G.O.B. spelter, foreign, duty paid ... £122 0 0 d/d
G.O.B. spelter, domestic £122 0 0 d/d
Electrolytic and refined zinc £126 0 0 d/d
Special high grade £128 0 0 d/d

ANTIMONY

English (99%) delivered,
10 cwt. and over £225 per ton
Crude (70%) £210 per ton
Ore (60% basis) 22s. 6d./27s. 6d. nom. per unit, c.i.f.

NICKEL

99.5% (home trade) £454 per ton

OTHER METALS

Aluminium, £157 per ton. Osmiridium, £35 oz. nom.
Bismuth, 18s. lb. Osmium, £70 oz. nom.
(min. 2 cwt. ex-warehouse). Palladium, £8 10s. oz.
Cadmium, (Empire) 14s. 4d. lb. Platinum, £27/33 5s. nom.
Chromium, 6s. 5d. lb. Rhodium, £45 oz.
Cobalt, 20s. lb. Ruthenium, £30 oz.
Gold, 248s. f.o.z. Quicksilver, £64 10s.
Iridium, £65 oz. nom. ex-warehouse
Magnesium, 2s. 10½d. lb. Selenium, 25s. nom. per lb.
Manganese Metal (96%-98%) Silver 73d. f.o.z. spot and f'd.
2s. 2d./2s. 3d. per lb. d/d Tellurium, 18s./19s. lb.

ORES, ALLOYS, ETC.

Bismuth 40% 7s. lb. c.i.f.
Chrome Ore— 30% 5s. 9d. lb. c.i.f.
Rhodesian Metallurgical (lumpy) £14 2s. per ton c.i.f.
" " (concentrates) £14 2s. per ton c.i.f.
" " Refractory £13 14s. per ton c.i.f.
Baluchistan Metallurgical ... £15 8s. per ton c.i.f.
Magnesite, ground calcined ... £26 - £27 d/d
Magnesite, Raw £10 - £11 d/d
Molybdenite (85% basis) ... 105s. 10d. per unit c.i.f.
Wolfram (65%) 425s. c.i.f. U.K. buying
" " 447s. 6d. d/d U.K. selling
Tungsten Metal Powder 31s. 7d. nom. per lb. (home
(for steel manufacture)
Ferro-tungsten 28s. 7d. nom. per lb. (home
Carbide, 4-cwt. lots £32 3s. 9d. d/d per ton
Ferro-manganese, home ... £48 5s. 2d. per ton
Manganese Ore U.K.
(48% - 50%) 6s. per unit
Brass Wire 2s. 9d. per lb. basis.
Brass Tubes, solid drawn ... 2s. 3½d. per lb. basis.

COMPANY NEWS AND VIEWS

Costs Cut Profits at Boulder Perseverance

Although Boulder Perseverance dealt with a larger tonnage than in the previous year, whilst maintaining the grade of ore sent to the mill, costs continued to rise, with the result that after meeting all charges, including taxation, net profit was nearly £8,000 less than in the preceding year. In the circumstances, the distribution was lowered to 7½ per cent, the allocation to general reserve was halved at £5,000, leaving the carry forward at the fiscal year end slightly lower than in the previous year.

Year to	Treated	Grade	Cost	Bullion	Ore Reserves
Mar. 31	(tons)	(dwt.)	per ton	Revenue	Tons Grade
			s. d.	£	(dwt.)
1952	132,387	4.9	46 7	397,844	334,550 4.9
1951	114,810	4.9	42 2	332,852	387,400 4.8

Boulder Perseverance owns 67.7 per cent of the capital of the Kalgurli Ore Treatment Co., a non-profit earning co-operative treatment plant with the capacity of approximately 1,000 tons per day, and during the year this company continued to operate at a very high level of efficiency with a computed recovery of 94.59 per cent. Boulder also owns 65.2 per cent of the issued share capital of the Australian registered company, Kalgoolie Enterprise Mines, which operates the Enterprise lease adjacent to the Perseverance lease. This company during the year treated 56,644 tons of ore averaging 6.19 dwt., an increase of 10,600 tons with the reduction of 0.47 dwt. as compared with the previous year. Ore reserves showed an increase to 231,400 tons with an unchanged grade of 6.3 dwt.

Year to	Gross	Mine	Tax	Net	Divi-	Carry
Mar. 31	Revenue	Costs		Profit	dend	Forward
	£	£	£	£	%	£
1952	399,432	337,085	24,324	13,793	7½	6,778
1951	340,267	263,433	30,450	21,659	10	6,838

Dr. K. B. Edwards, chairman of Boulder Perseverance, in his statement accompanying this year's report and accounts, states that inflation in Australia is now beyond the control of any political party. More than that, he believes that this inflation has produced a state of affairs which is progressively more and more unsound. In particular, he feels that the policy of favouring the development of secondary industries in preference to the primary industries can only lead to disaster, as it has done wherever this policy has been tried in countries without a large consuming public and ample natural resources.

About the free gold market, the chairman cleared the air of any illusions which shareholders might harbour concerning the important question of how free is the "free market." Quite categorically, Dr. Edwards declared that the term "free" is completely misapplied and deceptive, as a proportion of the gold produced is retained by the Commonwealth Bank of Australia and the remainder may only be sold for U.S. dollars, at a price based on the extraordinary fiction that the U.S. dollar is still worth its pre-war value. Furthermore, the proceeds in U.S. dollars must be credited to the Commonwealth Bank from whence the mining companies are paid in Australian currency. Nor are the companies allowed to sell their gold for Australian or any other currency on an open or free market. He also reminds stockholders that the purchasing and holding of gold by private individuals or corporations is still a penal offence throughout the British Commonwealth. Summing up, Dr. Edwards said that the position therefore becomes one in which balances of payment to the United States are made in gold at the pre-war price, which is equivalent to paying approximately three times as much.

Concerning British taxation the chairman was no less forthright. It would be incredible, he states, were it not unfortunately true, that to pay a 10 per cent dividend, no less than 67 per cent of the company's profits are taken in taxation. Such iniquitous taxation, he asserts would render any industrial venture or project extremely doubtful, but in the mining industry such taxation is fantastic folly.

The annual meeting will be held in London on September 24.

Lahat Prepares New Paddock

Tribute revenue of the Lahat Mines for the year ended March 31, 1952, fell sharply from £52,851 to £14,937, reflecting the contraction in the tributaries' output from 253 tons to 131 tons. Shareholders, however, were forewarned that production would be reduced in the general manager's report for the previous year, where it was stated that "reduced outputs must be expected from the Temple area while the paddock was being developed laterally to permit the treatment of high values in depth." The magnitude of the task of preparing the paddock for exploitation was put in its proper perspective in the previous report by the chairman, Mr. E. V. Pearce, who said that the development of the Temple area was tantamount to opening out a new mine.

Year to	Gross	Mine	Tax	Net	Divi-	Carry
Mar. 31	Revenue	Expenditure		Profit	dend	Forward
	£	£	£	£	s. d.	£
1952	16,287	3,441	6,638	3,315	1 3	2,035
1951	55,443	2,627	31,166	19,303	4 6	2,757

With regard to the incidence of E.P.L., the company is permitted to select the years 1949 and 1950 as their Standard year and thus the company's Standard Profit will be well above the disappointing results achieved during the year under review.

The annual meeting will be held in London on September 23.

Outlook for Amalgamated Anthracite Collieries

At last, more than five years after the vesting date, the general position arising from the Coal Industry Nationalization Act, *vis-à-vis* Amalgamated Anthracite Collieries has become reasonably clear, states the company's chairman, Mr. John Waddell, in his address to shareholders accompanying report and accounts for the calendar year 1951.

During the year an attempt was made to divide the global sum awarded to South Wales which had been fixed at a figure, he said, which was obviously hopelessly inadequate to meet the fair and full claims of the collieries. Although the net amount awarded to the company based on its tonnages, compared with the other colliery tonnages at the time of nationalization, is somewhat below the average of the entire district, the chairman believed that there would be no advantage in going through the valuation procedure which might have taken several years and might have resulted in the company being considerably worse off.

The net effect of settlement will be, he believed, that the amounts to be collected will enable all the bank overdrafts of the colliery companies to be cleared and will provide roughly for a reduction of nearly two-thirds of the loans from the subsidiary company. At the end of 1951 this totalled approximately £1,400,000 thus leaving a sum, after all adjustments, of approximately £600,000 still due to the British Anthracite Co., the operating subsidiary.

The final effects of all this, he declared, is that Amalgamated Anthracite would be left holding the entire share capital of the British Anthracite Co., a valuable asset earning good profits, which would be the entire asset of the company on which its future depends.

The question of a capital reconstruction was referred to by the chairman, and he said that this was a matter to which considerable thought had been given, but that at present the Board could see no profitable opportunity in which the company could achieve anything likely to be satisfactory.

We have the situation, he said, that the share capital is only partially covered by assets and the Preference Stock has first call on those assets. On the other hand, the company has produced profits this year which show, subject to taxation, that the ordinary stock may be earning 15 per cent or more and therefore has quite good long-term prospects.

The chairman declared that by a careful re-deployment of resources a great deal has been done to offset the effects of the Coal Nationalization Act and to provide stockholders with a future reflected in dividends when two conditions, cash and taxation, are complied with. A half a million more liquid cash was needed and as soon as the opportunity is right the chairman said, this cash will be raised by means of notes "or something of that nature" to put the liquid position right and to start a policy of increased dividends on Preference and some dividend on the Ordinary stock of the parent company.

Mining Matters

R.S.M. Degree Course in Mineral Dressing.—The Senate of London University has at last approved the establishment of a degree course in mineral dressing at the Royal School of Mines. This is to be a full three-year post-intermediate degree course. Hitherto it has only been possible for students to take mineral dressing as part of one or other of the established courses and it must be a source of gratification to those who have been working for so long towards the establishment of an independent degree course that this should finally have been recognized just as the School of Mines is preparing to hold its forthcoming symposium on mineral dressing which is being organized by the Institution of Mining and Metallurgy.

Mr. Lincoln Gordon, new M.S.A. chief in U.K. Mr. Lincoln Gordon, one of the pioneers of the Marshall Plan, and the Mutual Security Programme, has been appointed Minister in Charge of the Mutual Security Agency's Special Mission to the United Kingdom. Mr. Gordon will also hold the post of Minister for Economic Affairs at the American Embassy in London, succeeding in both posts **Mr. William L. Batt**, who has served for nearly two years as Chief of the London Mission of E.C.A., and its successor organization, the Mutual Security Agency.

The North of England Institute of Mining and Mechanical Engineers have announced that they will hold Centenary Celebrations (1852-1952) at Neville Hall and King's College, Newcastle-upon-Tyne, 1 for a week commencing Monday, September 22.

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Intending candidates should apply in writing to the Director of Recruitment (Colonial Service), Colonial Office, Sanctuary Buildings, Great Smith Street, S.W.1, giving brief details of their age, qualifications and experience. They should mention this paper and quote the reference number (C.S.D. 63/9/01).

SITUATIONS VACANT ADVERTISED.—The Notification of Vacancies Order, 1952, must be complied with where applicable.



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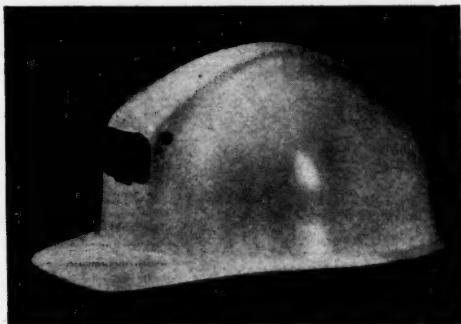


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